

CLAIMS

What is claimed is:

1. A method, comprising:
growing a substantially vertically aligned carbon nanostructure, the substantially vertically aligned carbon nanostructure coupled to a substrate;
covering at least a portion of the substantially vertically aligned carbon nanostructure with a dielectric;
forming a gate, the gate coupled to the dielectric; and
releasing the substantially vertically aligned carbon nanostructure by forming an aperture in the gate and removing a portion of the dielectric.
2. The method of claim 1, wherein removing a portion of the dielectric includes reactive ion etching.
3. The method of claim 1, further comprising forming a dielectric protection layer, the dielectric protection layer coupled to the gate, before releasing the substantially vertically aligned carbon nanostructure.
4. The method of claim 1, wherein a single substantially vertically aligned carbon nanostructure is released.
5. The method of claim 1, wherein forming the aperture includes self aligning the aperture relative to the substantially vertically aligned carbon nanostructure.
6. The method of claim 5, wherein the aperture is formed by chemical mechanical polishing.
7. The method of claim 1, further comprising
coupling another dielectric to the gate before uncovering the substantially vertically aligned carbon nanostruture; and

coupling a focusing electrode to the another dielectric before releasing the substantially vertically aligned carbon nanostructure.

8. The method of claim 1, wherein growing the substantially vertically aligned carbon nanostructure includes growing a vertically aligned carbon nanofiber.

9. A gated field emission device made by the method of claim 1.

10. An integrated circuit, comprising a gated field emission device made by the method of claim 1.

11. An apparatus, comprising:
 - a substantially vertically aligned carbon nanostructure coupled to a substrate;
 - a dielectric coupled to the substrate and surrounding at least a portion of the substantially vertically aligned carbon nanostructure;
 - a gate coupled to the dielectric, the gate including a aperture substantially aligned with the substantially vertically aligned carbon nanostructure;
 - another dielectric coupled to the gate, the another dielectric including a conduit substantially aligned with the substantially vertically aligned carbon nanostructure; and
 - a focusing electrode coupled to the another dielectric, the focusing electrode including another aperture substantially aligned with the substantially vertically aligned carbon nanostructure,

wherein the dielectric, the gate, the another dielectric and the another aperture define a well that circumscribes the substantially vertically aligned carbon nanostructure.
12. The apparatus of claim 11, wherein the substantially vertically aligned carbon nanostructure includes a vertically aligned carbon nanofiber.
13. The apparatus of claim 11, wherein the focusing electrode composes an electrostatic focusing lens.
14. The apparatus of claim 11, wherein the dielectric surrounds a single substantially vertically aligned carbon nanostructure.
15. The apparatus of claim 11, wherein the aperture is formed by chemical mechanical polishing.
16. The apparatus of claim 11, wherein at least a portion of the well is formed by reactive ion etching.
17. The apparatus of claim 11, wherein the focusing electrode includes another aperture that is substantially aligned with the aperture of the gate.

18. A method for emitting electrons which comprises utilizing the apparatus of claim 11.
19. A gated field emission device, comprising the apparatus of claim 11.
20. An integrated circuit, comprising the apparatus of claim 11.
21. A circuit board, comprising the integrated circuit of claim 20.